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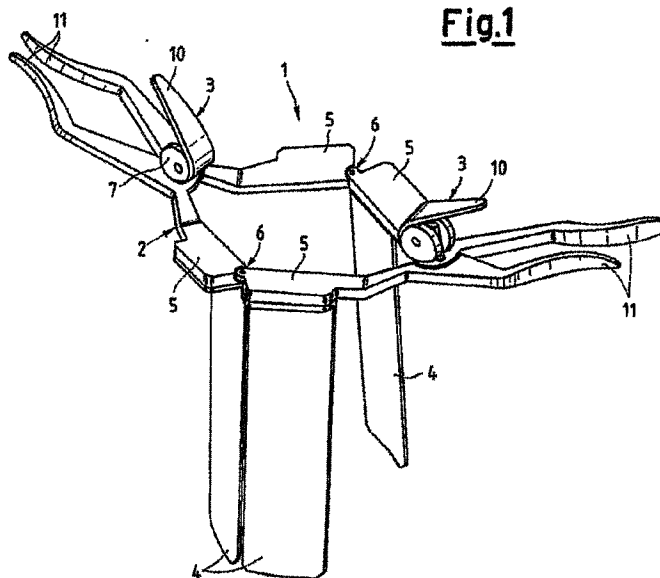
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(54) **Surgical retractor in particular for cholecystectomy.**

(57) The retractor (1) is of the autostatic type and comprises a retractor polygonal frame (2) associated with a plurality of dilators (4) which when inserted deeply into the patient's body maintain the edges of the incision open and the viscera of the effective operation area suitably withdrawn. The sides (5) of

the the frame (2) are hingedly connected to each other and two opposite hinges have their axes converging to a point located at the side of the frame (2) opposite to the dilators (4), so that the latter are spreaded out at their free ends to a greater degree than at the ends fastened to the frame (2).



**Fig.1**

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This invention relates to a surgical retractor, particularly for cholecystectomy.

In the current state of the art, a surgeon generally works with a series of instruments forming the normal accompaniment to an operating table. In most cases these instruments are multi-functional in the sense that they can serve the same purpose or similar purposes in numerous types of operation.

Because of their generalized structure these instruments require the surgeon to exercise greater commitment and ability to enable them to be used correctly in different situations. In this respect he has to be particularly attentive in order to overcome any deficiencies deriving from the generalized structure of the instrument.

In addition in the particular case of microsurgery these instruments cannot be used correctly in most cases.

In the case of cholecystectomies, the operation is performed by making an incision currently of about twenty centimetres. The edges of the cut are kept apart using instruments usually also used for other types of operation.

The size of the incision is relatively large compared with the size of the effective operation area. This size is mainly due to the need to reach an organ (the gall-bladder) located deep within the patient's body and submerged by other viscera.

It is however well known that it is the size of an abdominal surgical incision which mostly determines the duration of the post-operative stage by externally exposing the abdominal viscera for a time such as to induce reflected intestinal paralysis, the duration of which is greater the more extensive and prolonged is the exposure of said viscera. Consequently reducing the incision and hence the operation time would have undoubted advantages both for the patient and for the logistic structure required for his assistance during the post-operative stage.

The object of the present invention is to provide a surgical retractor particularly for cholecystectomy which is able to overcome the aforesaid drawbacks by enabling the access incision to the gall-bladder to be kept open during the operation while at the same time localizing the gall-bladder in such a manner that the surgeon is able to operate comfortably by gaining deep access to it via an incision of dimensions which are basically small compared with the area of effective operation.

This object is attained by a surgical retractor particularly for cholecystectomy, characterised by comprising a retractor frame formed from a series of sides hinged to each other, means for locking said retractor frame in an autostatic position, and a plurality of dilators rigid with the sides of the retractor frame, said dilators being of substantially thin plate form and extending along an axis which cuts

the retractor frame. The invention is illustrated by way of non-limiting example in the figures of the accompanying drawing.

Figure 1 is a perspective view of the instrument in the open position;

Figure 2 is a side view of the instrument in the closed position;

Figure 3 is a plan view of the instrument in the closed position;

Figure 4 is an opposite plan view to the preceding, showing the instrument in the close position;

Figure 5 is a front view of an alternative form of dilator. With reference to said figures, the surgical retractor of the invention, indicated overall by the reference numeral 1, is of the type usable particularly but not exclusively for cholecystectomy operations.

Said retractor 1 comprises a retractor frame 2, means 3 for locking said frame in an autostatic position, and dilators 4. The retractor frame 2 is formed from a series of sides 5 joined together by hinges. In the illustrated example the retractor frame 2 is an articulated quadrilateral, at the vertices of which there are two pairs 6 and 6A of opposing hinges comprising pins 8 and 8A respectively.

The hinges of the pairs 6A have their axes of rotation 16A converging at an angle  $\alpha$  indicatively of between  $50^\circ$  and  $60^\circ$ , whereas the remaining pairs 6 of hinges have their axes 16 parallel, the reason for this being clarified hereinafter. The means 3 for locking the frame in an autostatic position comprise in the illustrated example two cams 7 manually operated by levers 10 and acting via a pin 8 on a pair of toothed jaws 9 rigid with two mutually hinged sides 5 of the retractor frame 2. In the illustrated example the locking means are provided at the hinges 6A, and the toothed jaws 9 are formed directly on the sides 5 which converge at said hinges 6A.

At the hinges 6A the sides 5 are prolonged to form a pair of arms 11 arranged such that when made to approach each other they automatically cause the retractor frame 2 to widen and hence open. The position of maximum opening of said frame is attained when the arms of each pair are brought into touching contact. The dilators 4 are removably secured to the retractor frame 2, and in the illustrated example by screws 12 to the sides 5 of the retractor frame 2. In this manner one group of dilators 4 can be quickly and easily replaced by another. Alternatively, the dilators 4 can be fixed irremovably to the retractor frame 2.

The dilators 4 are substantially of thin plate form and extend along an axis which cuts the retractor frame 2. They have an indicative length of between 6 and 12 cm and are chosen on the basis

of the size of the patient and/or the depth of the effective operating region within the patient's body.

The number of dilators 4 is usually equal to the number of sides 5 of the retractor frame 2. However if the instrument is used for cholecystectomies the number of dilators 4 is one less than the number of sides 5. In the illustrated example the dilators are three in number.

This is because of the particular position of the gall-bladder relative to the other viscera, in that the presence of a further dilator 4 beyond the three would obstruct access to the gall-bladder.

Instead of a missing dilator 4, one could possibly be provided having a suitably chosen length different from the others.

The dilators 4 have a concave cross-section and are arranged with their concavity facing the interior of the retractor. The dilators 4 have their outer ends 13 bevelled.

The purpose of the retractor 1 is to keep the incision open during the operation and at the same time separate the viscera which would otherwise interfere with the effective operating region. The instrument is inserted into the incision in the closed position (see Figures 2 and 3) and possibly locked in this position by the locking means 3.

This insertion is facilitated by the flat arrangement of the dilators 4 with their axis perpendicularly cutting the retractor frame 2, their plate structure and the presence of the bevels 13. The length of the dilators 4 enables effective operating areas deep within the patient's body to be reached.

On moving the arms 11 the retractor frame 2 opens to assume the configuration shown in Figure 1. When in the final required configuration, which is achieved by moving the arms 11 to a greater or lesser degree (and hence opening the edges of the incision to a greater or lesser extent), the retractor is locked by the means 3. This is done by pressing on the levers 10, by which the cam 7 acts on the pin 8 to rigidly lock the engagement of the pairs of toothed jaws 9.

Because of the convergence of the axes 16A of the hinges 6A, the retractor frame 2 in passing from the closed to the open configuration changes the plane in which it lies. Consequently, in addition to withdrawing from each other, the dilators 4 incline so that the bevelled ends 13 project outwards from the retractor 1 to enlarge the effective operating area beyond the extent that the edges of the incision are withdrawn from each other, and hence more than the width of the incision itself.

It is apparent that in this manner a relatively large effective operating area within the patient's body is available with relatively small incisions.

The retractor frame and dilators can be of metal or plastics construction, possibly provided in packs for once-only use. In an alternative embodi-

ment the dilators can be constructed of materials able to emit light when traversed by light rays. With particular reference to Figure 5, the dilators 4 can be provided with a supplementary dilator 14 hinged at 15 such that when the supplementary dilator 14 is superposed on the dilator 4 they have one of their edges parallel to each other and co-incident. In the illustrated example, the supplementary dilator 14 is triangular and has a smaller area than the dilator 4. In other embodiments the supplementary dilator 14 can be of such an extension as to reach the lower end of the dilator 4 to which it is hinged.

The supplementary dilators 14, which can rotate about the hinge 15, are made to project laterally from the relative dilator 4 after the retractor has been inserted into the patient's body, so helping the dilator 4 to which they are hinged to better retain the organs not concerned in the operation, and thus better defining the effective area concerned in the operation.

#### LEGEND

1)	Surgical retractor
2)	Retractor frame
3)	Means for locking in an auto-static position
4)	Dilators
5)	Sides
6)	Hinges
6A)	Hinges with converging axes
7)	Cam
8) and 8A)	Pins
9)	Toothed jaws
10)	Levers
11)	Arms
12)	Dilator fixing screws
13)	Bevelled outer ends
14)	Supplementary dilator
15)	Hinge
16 and 16A)	Axes of rotation

#### Claims

1. A surgical retractor (1) particularly for cholecystectomy, characterised by comprising a retractor frame (2) formed from a series of sides (5) hinged to each other, means (3,7-10) for locking said retractor frame (2) in an auto-static position, and a plurality of dilators (4, 14) rigid with the sides (5) of the retractor frame (2), said dilators (4, 14) being of substantially thin plate form and extending along an axis which cuts the retractor frame (2).
2. A surgical retractor as claimed in claim 1, characterised in that the number of dilators (4,

14) is at least one less than the number of sides (5) of the retractor frame (2).

3. A surgical retractor as claimed in claim 1, characterised in that the means for locking in an autostatic position comprise at least one cam (7) acting via a pin (8A) on a pair of toothed jaws (9) rigid with two mutually hinged sides (5) of the retractor frame (2).

4. A surgical retractor as claimed in claim 1, characterised in that the retractor frame (2) is an articulated polygonal frame in which a pair of opposing hinges (6A) have converging axes of rotation.

5. A surgical retractor as claimed in claim 4, characterised in that the axes of rotation of the opposing hinges (6A) converge at a point situated opposite the dilators (4, 14) on the retractor frame (2), said axes of rotation forming a contained angle indicatively of between 50° and 60°.

6. A surgical retractor as claimed in claim 4, characterised in that the pins (8A) on which the means (7, 10) for locking in an autostatic position act are the rotation pins of the opposing hinges (6A) having their axes of rotation convergent.

7. A surgical retractor as claimed in claim 4, characterised in that the retractor frame (2) comprises at least one pair of manually operable widening arms (11) obtained by prolonging those sides (5) of the retractor frame (2) hinged together by at least one of the hinges (6A) having its axis of rotation convergent with the remainder.

8. A surgical retractor as claimed in claim 1, characterised in that the dilators (4, 14) are perpendicular to the retractor frame (2) when this is in its closed position.

9. A surgical retractor as claimed in claim 1, characterised in that the dilators (4, 14) are removably secured to the retractor frame (2) to enable them to be easily replaced by others.

10. A surgical retractor as claimed in claim 1, characterised in that the dilators (4) have a substantially arcuate cross-section with its concavity facing the interior of the retractor (1).

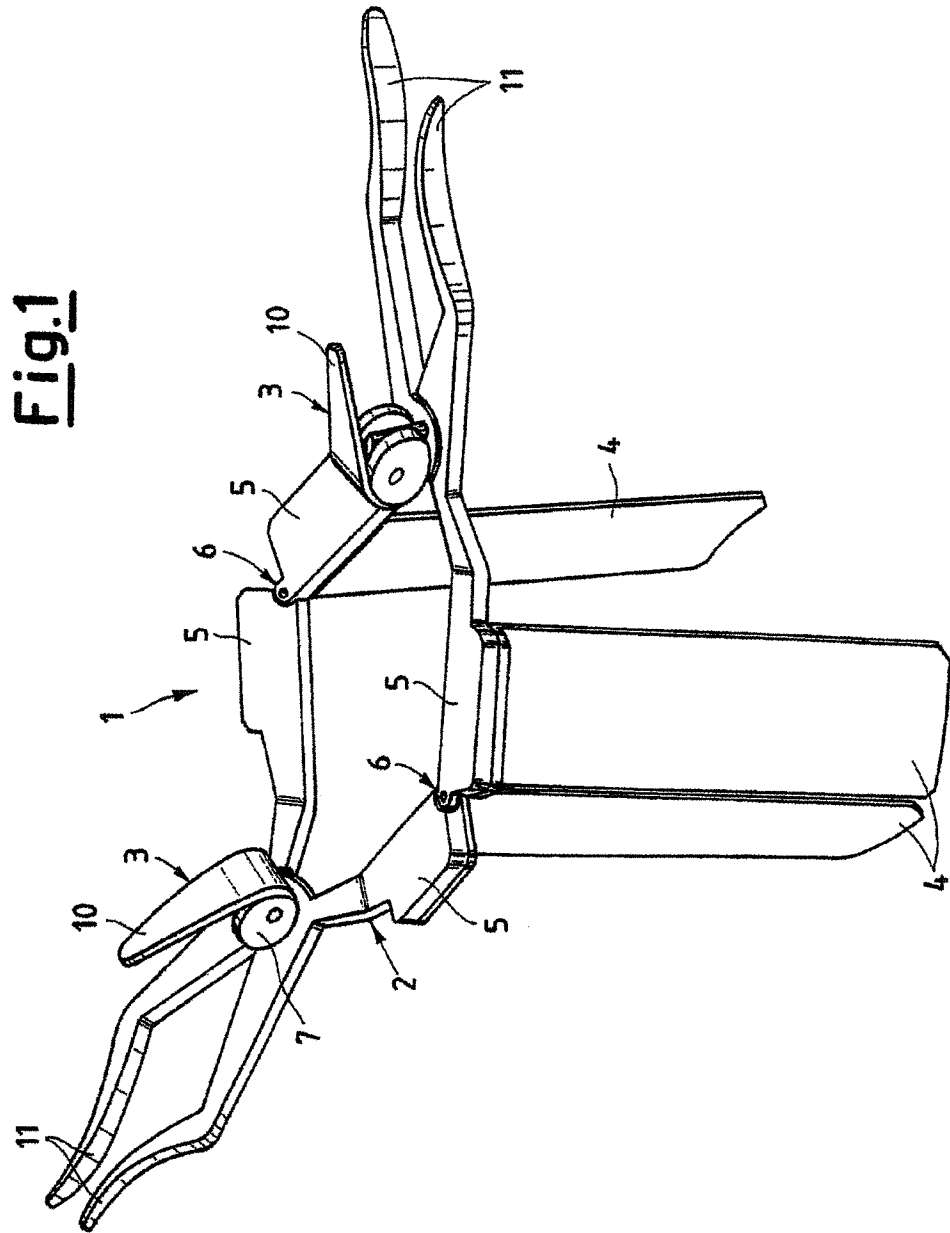
11. A surgical retractor as claimed in claim 1, characterised in that the dilators (4, 14) are constructed of a material able to emit light

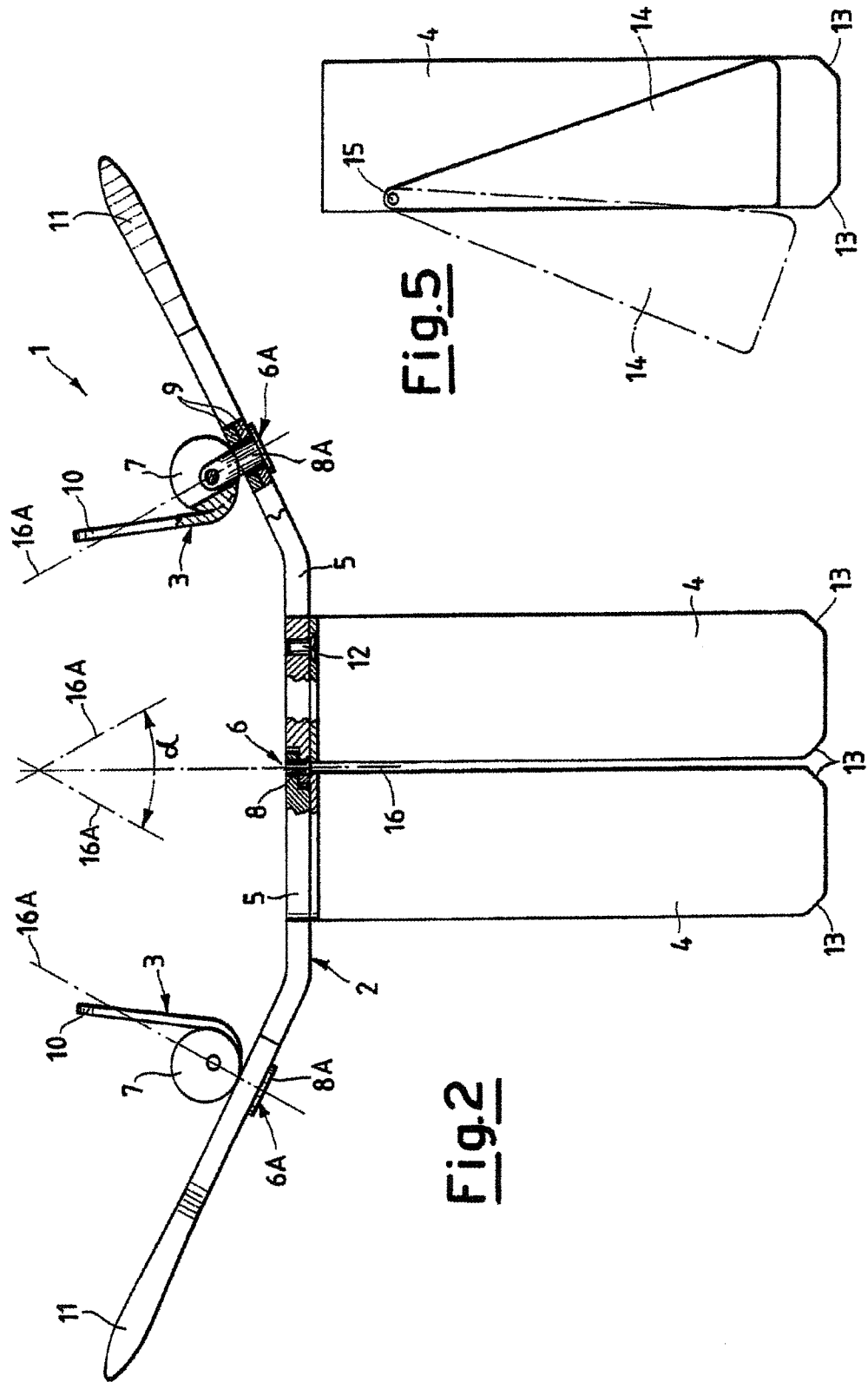
when traversed by light rays.

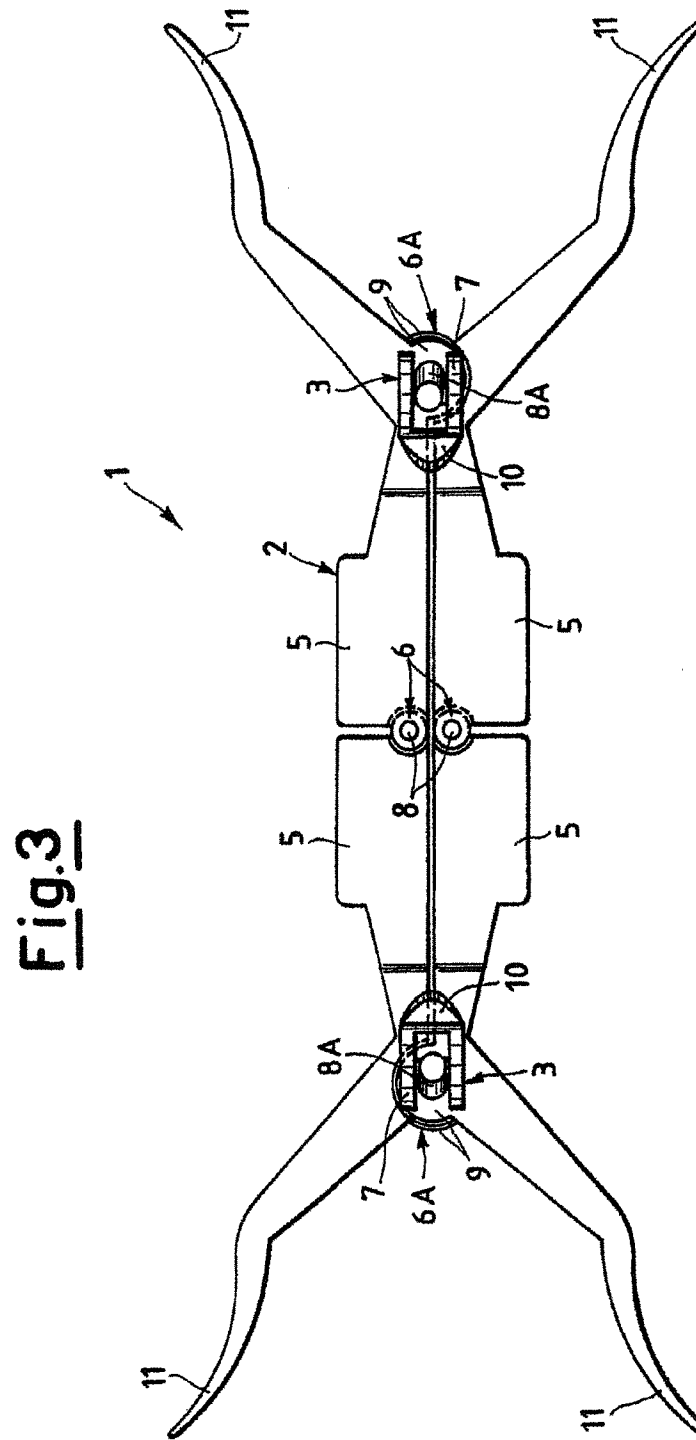
12. A surgical retractor as claimed in claim 1, characterised in that said dilators (4) are associated with supplementary dilators (14), which are hinged to them.

13. A surgical retractor as claimed in claim 1, characterised in that the dilators (4) used during cholecystectomies have a length indicatively of between 6 and 12 cm.

14. A surgical retractor as claimed in claim 12, characterised in that the supplementary dilators (14) are of triangular shape and are hinged (at 15) at a vertex so that when the dilators are superposed one of the edges of one is parallel to that edge of the other.







**Fig.4**

